THE EFFECT OF INEQUALITY ON SATISFACTION

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ABSTRACT

This paper seeks to find a relationship between satisfaction and inequality. By performing a cross country analysis on 112 countries this paper found a statistically significant positive relationship. Most past studies show that there is no discernable relationship in developed countries and there is some relationship in developing nations. However, this paper found no studies that attempted to perform an analysis across all types of countries. The analysis included looking at both economic and social variables and found varying degrees of significance among them. Future studies could look at increasing the sample size, using other measures of inequality and adding new explanatory variables.

1. Introduction

Income inequality has always been a highly debated topic, whether it be by politicians, economists, or the general public. There have been numerous studies conducted in which it was found that inequality is positively associated with crime and working hours, and negatively associated with health, trust, political engagement, and mobility (Hajdu & Hajdu 2014), suggesting that income inequality within a nation causes the well-being of that nation and its citizens to decline. This implication is the foundational argument of those advocating for policy to reduce income inequality, claiming that to treat income inequality as a major issue to be ameliorated would mean a general increase in a nation's development and well-being for its citizens.

Opponents of policy attempting these changes often pose the question of whether a reduction in income inequality would actually increase the standard of living within a nation, and whether a person's subjective satisfaction is actually related to the income distribution within their nation or not. Researchers who have attempted to determine the relationship between a nation's income inequality and subjective well-being have produced several different results, leading to much discourse in the field as to what the best approach to income inequality would be. For example, Wu and Li (2013) found that as income inequality increased in China, life satisfaction also decreased and supported pursuing policy to ameliorate the issue of increasing income inequality, while Zagorski et al. (2013) found no significant relationship between income inequality and satisfaction and concluded that more conclusive studies should be conducted before action is taken against income inequality. As we enter an age where there is a greater focus on development, and the subjective satisfaction of a nation is being considered an important measurement of development, it is vital for conclusions to be made on the relationship between this factor and income inequality so that the nations of the world can pursue policy that will propel their development forward and we can achieve a better global standard of living.

Our study will attempt to contribute to this research, with us entering our analysis with the belief that there will be a negative correlation between income inequality and happiness as found by Wu and Li (2013). To put it simply, we predict that as the distribution of income within a nation becomes more unequal, the general level of subjective satisfaction of that nation's people will decrease. We will also consider several additional parameters that we consider to have a potential effect on people's satisfaction, such as unemployment, where we expect to see a

negative correlation with satisfaction, the human development index, where we expect to see a positive correlation, and economic freedom index score, where we also expect to see a positive correlation.

2. Literature Review

In Easterlin's (1974) seminal work, he defines the concept of happiness as a subjective and inherently personal metric. Each individual judges their happiness in terms of their own standards. This method is far superior to having a criterion that define happiness since it takes into account the differences in financial and cultural backgrounds of people. Using this definition, he then determines that within countries there is a positive relationship between income and happiness; however when making comparisons between countries the relationship becomes tenuous. After further analysis, Easterlin posits that in the United States average happiness levels remain flat with large increases in income. Easterlin concludes his paper saying there isn't statistical evidence to suggest that an increase in wealth can lead to an increase in "happiness."

Wang, Pan, and Luo (2014) conducted a study to measure the relationship between income inequality and happiness in China, a rapidly developing nation, by measuring subjective well-being with the Gini coefficients of the different counties in China. Their study found that happiness increased with the Gini coefficients until the coefficient reached a value between 0.42 and 0.44, and decreased with inequality after Gini coefficient increased beyond the value between 0.42 and 0.44.

In a study conducted by Zagorski et al. (2013), it was found that examining the relationship between the Gini coefficient and happiness alone does not provide effective insights into the effects of income inequality and happiness, and that several variables such as the economic well-being of a nation measured in Gross Domestic Product per capita should be controlled for and considered in the relationship between income inequality and happiness. Using a group of European nations, researchers found a strong negative correlation between the Gini coefficient and happiness when these two variables were regressed together alone; however, after controlling for GDP per capita, researchers found evidence supporting the theory that income inequality measured by the Gini coefficient actually did not have a significant effect on a nation's general level of happiness.

Graham and Felton (2005) conducted an overview of the research on this topic, and then assessed the relationship of relative inequality and happiness in Latin America. The past literature on the subject has not discovered a strong relationship between inequality and Happiness in Europe and the US. Graham and Fulton argue that inequality can have different effects on welfare based on the context and measure that is available. For the case of the US and Europe, inequality can be a signal of opportunity and upward mobility. The authors posit that this assertion doesn't hold for regions with more imperfect markets, such as Latin America, where inequality signals a persistent disadvantage for the poor and a persistent advantage for the wealthy. Instead of the conventional aggregate measure of wealth, the authors used the difference between individual wealth and average wealth per country and applied it to Latin America. They found a significant effect of relative income on happiness, and concluded that inequality or relative position matters more in Latin America than it does in other places. The authors created an interesting discussion by exposing the relationship between relative inequality and happiness, and by bringing awareness to the underlying subjectivity of the two notions studied in the paper.

Ferrer and Ramos (2014) also brought awareness to the fact that the effect of inequality on individual happiness depends on the viewpoint the individual is using. Individuals can link inequality with worse or better outcomes, which influences their like or dislike for it. Those with larger prospects for upward mobility have a higher tolerance for inequality, as argued by Graham and Felton. In addition, a person's perception of inequality depends on his or her position in the group being studied. Individuals will like inequality to the extent they experience a positive compensation effect. In essence, according to the author, people's happiness does not depend on objective inequality, but on people's perception of inequality.

With our study, we aim to examine the relationship between happiness and inequality in a different scope than previous studies by examining the potential effect of additional economic parameters such as the economic freedom score and unemployment on a nation's level of satisfaction. We also hope to introduce a variable that considers several cultural factors, such as the health and educational conditions within the nation to determine its effect on the relationship between income inequality and satisfaction. All of the data used in our study will also consist of numbers from recent years, in order to keep the research up to date with a rapidly changing world stage. Further, where most previous studies limit their analysis to individual regions or

countries, we attempt to find a trend across numerous countries in distinctly different regions and at varying levels of development.

3. Data and Methodology

Summary Statistics and Description of Variables

Table 3.1 Summary Statistics

Variable	*Observations*	*Mean*	*Std. Dev.*	*Min*	*Max*
Satisfaction	112	5.949	1.351	2.6	8.5
Gini Index	112	38.936	9.226	16.64	63.72667
EFI	112	62.104	9.147	36.3	82
Unemp. Rate	112	8.760	6.288	0.4	31
HDI	112	0.701	0.165	.348	0.944
Developed	112	0.321	0.469	0	1

Table 3.2 Correlation Among Variables

	Satisfaction	*Gini Index*	*EFI*	*Unemp. Rate*	*HDI*
Satisfaction	1.000				
Gini Index	-0.088	1.000			
EFI	-0.084	0.072	1.000		
Unemp. Rate	0.748	-0.382	0.095	1.000	
HDI	0.537	-0.251	-0.037	0.700	1.000

I. Satisfaction

In our study, we use a satisfaction index as a gauge for the standard of living. Data for satisfaction comes from the World Database of Happiness. World Database of Happiness aggregated responses from surveys spanning the years 2005-2014 to determine the average life-satisfaction of individuals from 159 countries. Specifically the question posed to individuals who took the survey was:

> "Suppose the top of the ladder represents the best possible life for you and the bottom of the ladder the worst possible life. Where on this ladder do you feel you personally stand at the present time?"

Values were then assigned on a 11 point system and averaged for each country.

II. Income Inequality

We are measuring the income inequality of a nation by using the Gini coefficients from 2006 to 2014 World Bank databases. The Gini coefficient is a number from 0 to 100 that signifies a nation's level of income inequality, where a value closer to 0 is equivalent with lower levels of income inequality and a value closer to 100 is associated with greater levels of income inequality.

III. Index of Economic Freedom

The economic freedom index provides a ranking for measuring the economic freedom in a country. When The Heritage Foundation and Wall Street Journal originally designed the scale, they defined the highest degree of economic freedom as how freely individuals in a country can move labor, capital, and goods without any impediments. By assessing a country on 10 different factors that are encompassed by rule of law, limited government, regulatory efficiency, and open markets, a score is evaluated for the nation.

The intuition behind adding economic freedom to our model is that people's happiness is derived from the freedom they have to exercise their cash and how they feel about the government. This paper looks at scores from 2014.

IV. 20:20 Ratio

Ferrer and Ramos distinguished between relative and absolute inequality. The Gini index belongs to the latter category. The authors call for the usage of relative inequality measures to better assess the relationship between inequality and happiness. The ratio of the income owned by the highest 20% and the lowest 20% is a measure of relative inequality, and we intend to compare it with the gini index, as a measure of absolute inequality. The income shares were obtained from the world bank data bank from years 2006 to 2014.

V. Unemployment

The unemployment parameter is a measure of how many citizens in a country that are eligible for employment and in search for employment live without work. We include unemployment in our study as it encompasses factors from a nation's labor market that could play a role in the overall satisfaction of the country. Having this statistic is significant since job security plays a role in people's self worth and perception of the future. It is evident that this variable provides a potent and multifaceted understanding of a country's environment.

VI. Human Development Index (HDI)

The Human Development Index intends to capture some key dimensions that are needed to assess development of the population and their capabilities. It is a summary measure of achievement in three dimensions: life expectancy, education, and standard of living. We decided to include it to control for the relationship between happiness measured by satisfaction, and human development. The index was computed as stated in the 2014 Human Development Technical Report and obtained from the Human Development database.

VII. Development

We used a dummy variable called Development that indicates if countries are developed or not. The past literature in this subject has acknowledged that there's a difference in the relationship being studied for developed and developing countries. We decided to introduce this variable to account for this relationship. We classified developed countries using the income categorization from the World Bank. Table 4.3 and 4.4 list the developed and developing countries respectively.

Gauss Markov Assumptions

I. It is entirely possible to write the model in the populations as:

$$\square = \square_0 + \square_1\square_1 + \square_0\square_2 + \ldots + \square_\square\square_\square + \square$$

II. According to the experimental description of each variable it is safe to assume that data was collected via random sampling. However, we hint that the data for satisfaction might be biased, since it is convenient to survey individuals that live close to each other, and tend to respond similarly.

III. As seen in the descriptive statistics table, no independent variable is constant. Moreover, there are no perfect linear relations among the variables. We are suspicious of multicollinearity between a set of variables, but we computed the VIF and it wasn't large enough to conclude we had this issue with our data.

IV. There is no direct method to test for the fourth Gauss - Markov assumption, so we just impose it on our models. We assume that the expected value of the error term given any values of the independent variables is 0.

V. There is also no direct method to test for this assumption, so we impose it on our data. Thus, we assume that the variance of the error term due to any values of the independent variables is zero.

VI. Again, there is no direct method to test for this assumption, so we impose it on our data. We assume that the error term is normally distributed with mean 0 and variance σ^2.

4. Results

We began our study by completing a simple linear regression analysis on the relationship between satisfaction and the Gini coefficient for the 112 countries included in our study using the statistical software STATA. We were able to determine an equation where *satisfaction = 6.4489 - 0.0128gini*, which suggests there is a negative relationship between Gini and satisfaction but with a p-value 0.358, meaning the relationship between them is insignificant. For future reference, we will only consider variables that are significant at the 1%, 5%, and 10% levels of significance as relevant to our study. Because of the insignificance of Gini, we attempted to control for the unemployment rate within a country, the economic freedom score, and the human development index as we thought these factors may have an impact on

satisfaction within a country that will help clarify the effect of income inequality on satisfaction. The model we found after regressing satisfaction with all of our independent variables a model where *satisfaction=0.0017 + 0.0374gini - 0.0399unempl - 0.003score + 7.1763hdi*, with, based on the p-values of each variable, Gini, unemployment and HDI all being significant at the 1% level and the economic freedom score being insignificant at all relevant levels.

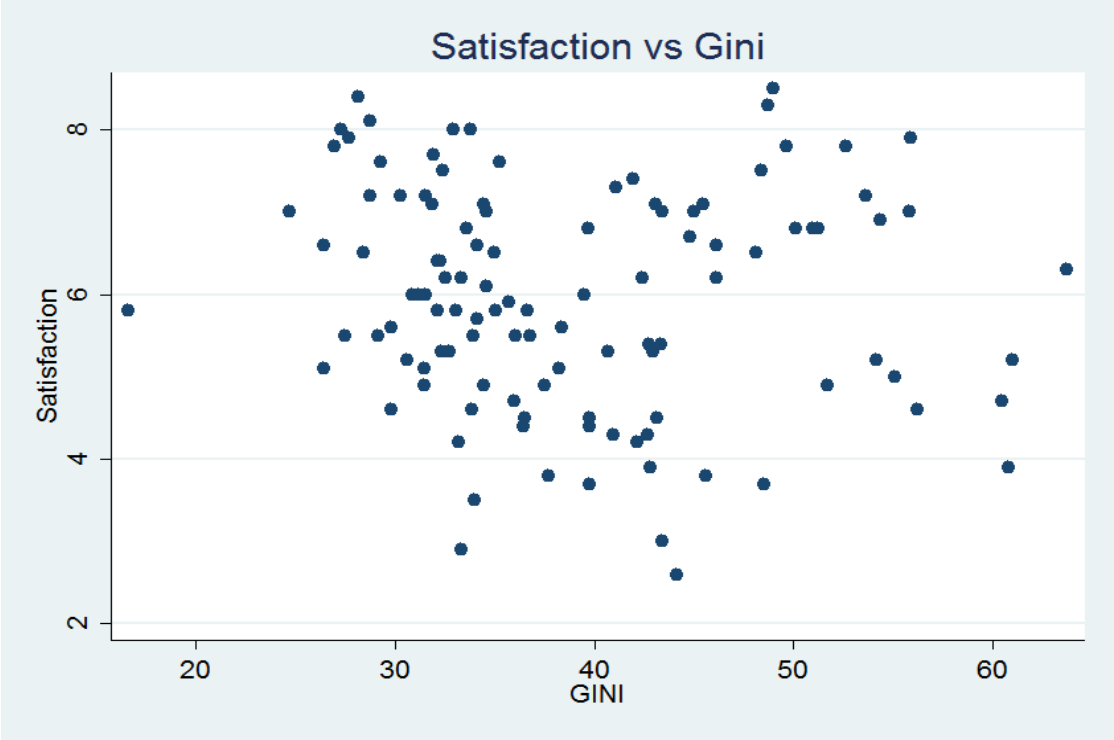

Figure 4.1: Plot of GINI vs. Satisfaction

Due to the high p-value of the economic freedom score (0.804), we considered the possibility of collinearity between this variable and the other independent variables and found that there is a correlation value of 0.7004 between the economic freedom score and the human development index. Therefore, we conducted an F-test between these two variables and found an F-value of 98.066, suggesting that these variables are greatly significant in determining satisfaction. This tells us that because the human development is significant in the original model and the economic freedom score is insignificant, most of the effect the economic freedom score has on satisfaction is already explained by the human development index, causing us to decide to no longer include the economic freedom score in our regression model and generate a model

where *satisfaction= -.1015 + 0.0373gini - 0.0395unempl + 7.0552hdi* in which all independent variables are significant at a 1% level.

However, because the coefficient associated with the Gini variable is positive and is against our hypothesis, we decided to consider the level of development of a country and its effect on the relationship between income inequality and satisfaction. To do this, we created a dummy variable to delineate a country as "Developed", in which case it was assigned a value of 1, or "Developing", in which case it was assigned a value of 0. We then regressed our working model with this new variable, and found that *satisfaction=0.085 + 0.0386gini - 0.0391unempl +6.605hdi +0.2294dev* when development was controlled for. However, the p-value of the dummy variable is equivalent to 0.357, suggesting that this variable is insignificant at the relevant levels and development is not important to our considerations of income inequality's relationship with satisfaction. Therefore, we decided to eliminate the development dummy variable from our model and created a final regression model to determine the effect of income inequality on satisfaction of

satisfaction= -.1015 + 0.0373gini - 0.0395unempl + 7.0552hdi

in which all independent variables are significant at the 1%, 5%, 10% levels of significance.

That each independent variable is considered significant at a 1% level of significance suggests that the coefficients associated with each variable are sufficient in explaining the relationship between that variable within a country and satisfaction. This said, we determine that there exists a positive relationship between the Gini coefficient and satisfaction, a negative relationship between unemployment and satisfaction, and a positive relationship between the human development index and satisfaction. While the latter two relationships are intuitive -- as unemployment decreases, satisfaction increases and as a nation's ranking on an index measuring development increases, satisfaction does as well -- the relationship between Gini and satisfaction suggests that as income inequality increases within a country, the satisfaction within the country also increases, which is the opposite of what we predicted to see in our hypothesis.

Table 4.1 Models Used in Paper

Models	
Model 1	*Satisfaction = Gini + u*
Model 2	*Satisfaction = Gini + EFI + Unemployment + HDI + u*
Model 3	*Satisfaction = Gini + Unemployment + HDI + u*
Model 4	*Satisfaction = Gini + Unemployment + HDI + Development + u*

Table 4.2 OLS Regression Estimates

Dependent Variable *Satisfaction*				
Independent Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Gini	-0.013 (-0.92)	0.037*** (4.03)	0.373*** (4.04)	0.038*** (4.13)
EFI		-0.003 (-0.25)		
Unemployment		-0.040*** (-3.13)	-0.039*** (-3.14)	-0.039*** (-3.10)
HDI		7.176*** (10.08)	7.055*** (13.65)	6.605*** (9.30)
Developed				0.229 (0.92)
Intercept	6.449*** (11.59)	0.002 (0.00)	-0.101 (-0.17)	0.085 (0.13)
R^2	0.0077	0.6383	0.6381	0.6409
Observations	112	112	112	112
Significance Level: * = 10%, ** = 5%, * = 1%**				

5. Conclusions

The findings of this paper support a positive relationship between happiness and inequality. We designed a regression model where we intended to explain the relationship between satisfaction and inequality by accounting for factors that we thought were needed to better describe the relationship, such as Human Development Index, unemployment, economic freedom, and a dummy variable to distinguish developed from underdeveloped countries. Our regression analysis deemed the economic freedom, and dummy variables as insignificant, so our final model contained GINI, HDI, and unemployment as explanatory variables.

The regression model uncovered a positive relationship between satisfaction and GINI, which does not support our initial hypothesis. Taking this into account, and looking at the scatter plot of satisfaction vs inequality we conclude that the relationship between these two variables cannot accurately be described via linear regression. For future studies of this relationship we advise considering other variables that might be relevant to explain the relationship, specifically we place importance on indicators for inequality, since the yearly observations for GINI are not quite numerous. We considered the 20:20 ratio as a measure of relative inequality following the thinking process outlined by Ferrer and Ramos (2014). Compared to GINI, the 20:20 ratio performed marginally worse, so we decided to preserve GINI as our measure for inequality. The detailed models with the 20:20 ratio are included in the appendix. To summarize, the authors of this paper encourage future studies to further explore other inequality measures as well as new variables, and to implement other regression techniques to uncover new models.

6. References

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Appendix

A. List of countries used

Developing Countries

Albania	Kenya
Angola	Kyrgyz Republic
Armenia	Lesotho
Azerbaijan	Liberia
Bangladesh	Madagascar
Belarus	Malawi
Benin	Malaysia
Bhutan	Mali
Bosnia and Herzegovina	Mauritania
Botswana	Mauritius
Brazil	Mexico
Bulgaria	Mongolia
Burkina Faso	Montenegro
Burundi	Morocco
Cambodia	Mozambique
Cameroon	Namibia
Central African Republic	Nepal
Chad	Nicaragua
China	Niger
Colombia	Nigeria
Costa Rica	Pakistan
Dominican Republic	Panama
Ecuador	Paraguay
El Salvador	Peru
Ethiopia	Philippines
Gabon	Romania
Georgia	Rwanda
Ghana	Senegal
Guatemala	Serbia
Guinea	Sierra Leone
Haiti	South Africa
Honduras	Sri Lanka
India	Tajikistan
Indonesia	Thailand
Jordan	Togo
Kazakhstan	Tunisia
Kenya	Turkey
Kyrgyz Republic	Uganda
Lesotho	Ukraine
Liberia	Zambia
Madagascar	

Developed Countries

Argentina	Israel
Australia	Italy
Austria	Japan
Belgium	Latvia
Canada	Lithuania
Chile	Luxembourg
Croatia	Netherlands
Cyprus	Norway
Czech Republic	Poland
Denmark	Portugal
Estonia	Slovenia
Finland	Spain
France	Sweden
Germany	Switzerland
Greece	United Kingdom
Hungary	United States
Iceland	Uruguay
Ireland	Venezuela, RB

B. STATA Output

```
. regress satisfaction gini
```

Source	SS	df	MS	Number of obs	=	112
				F(1, 110)	=	0.85
Model	1.55703092	1	1.55703092	Prob > F	=	0.3581
Residual	201.102881	110	1.82820801	R-squared	=	0.0077
				Adj R-squared	=	-0.0013
Total	202.659912	111	1.82576497	Root MSE	=	1.3521

satisfaction	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gini	-.0128377	.0139108	-0.92	0.358	-.0404056	.0147302
_cons	6.448953	.5564917	11.59	0.000	5.346117	7.551789

```
. regress satisfaction gini score hdi unempl
```

Source	SS	df	MS		
				Number of obs	= 112
				F(4, 107)	= 47.20
Model	129.349567	4	32.3373919	Prob > F	= 0.0000
Residual	73.3103442	107	.685143404	R-squared	= 0.6383
				Adj R-squared	= 0.6247
Total	202.659912	111	1.82576497	Root MSE	= .82773

satisfaction	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gini	.0373918	.0092857	4.03	0.000	.018984	.0557996
score	-.0030243	.0121747	-0.25	0.804	-.0271594	.0211107
hdi	7.176329	.712272	10.08	0.000	5.764333	8.588326
unempl	-.0399469	.012783	-3.13	0.002	-.0652876	-.0146061
_cons	.0017229	.7325523	0.00	0.998	-1.450477	1.453922

```
. regress satisfaction gini hdi unempl
```

Source	SS	df	MS		
				Number of obs	= 112
				F(3, 108)	= 63.46
Model	129.307288	3	43.1024295	Prob > F	= 0.0000
Residual	73.3526233	108	.679190956	R-squared	= 0.6381
				Adj R-squared	= 0.6280
Total	202.659912	111	1.82576497	Root MSE	= .82413

satisfaction	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gini	.0372922	.0092366	4.04	0.000	.0189836	.0556008
hdi	7.055193	.5169061	13.65	0.000	6.030595	8.07979
unempl	-.0394715	.0125839	-3.14	0.002	-.0644149	-.0145281
_cons	-.1014952	.600683	-0.17	0.866	-1.292153	1.089163

```
. regress satisfaction gini hdi unempl dev
```

Source	SS	df	MS	Number of obs	=	112
				F(4, 107)	=	47.75
Model	129.88844	4	32.4721099	Prob > F	=	0.0000
Residual	72.7714722	107	.680107217	R-squared	=	0.6409
				Adj R-squared	=	0.6275
Total	202.659912	111	1.82576497	Root MSE	=	.82469

satisfaction	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gini	.0386183	.0093535	4.13	0.000	.020076	.0571606
hdi	6.604996	.7104508	9.30	0.000	5.19661	8.013382
unempl	-.0390591	.0126003	-3.10	0.002	-.0640377	-.0140806
dev	.2294217	.2481868	0.92	0.357	-.2625797	.721423
_cons	.0850189	.6340487	0.13	0.894	-1.171909	1.341947

C. Analysis with 20:20 Ratio

```
. regress satisfaction ratio
```

Source	SS	df	MS	Number of obs	=	112
				F(1, 110)	=	0.01
Model	.01193026	1	.01193026	Prob > F	=	0.9360
Residual	202.647981	110	1.84225438	R-squared	=	0.0001
				Adj R-squared	=	-0.0090
Total	202.659912	111	1.82576497	Root MSE	=	1.3573

satisfaction	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ratio	.0018964	.0235653	0.08	0.936	-.0448045	.0485972
_cons	5.932825	.2395584	24.77	0.000	5.458076	6.407573

```
. regress satisfaction ratio unempl hdi score
```

Source	SS	df	MS	Number of obs	=	112
				F(4, 107)	=	46.82
Model	128.976539	4	32.2441348	Prob > F	=	0.0000
Residual	73.6833725	107	.68862965	R-squared	=	0.6364
				Adj R-squared	=	0.6228
Total	202.659912	111	1.82576497	Root MSE	=	.82984

satisfaction	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ratio	.0596884	.0151163	3.95	0.000	.029722	.0896547
unempl	-.0406989	.0128439	-3.17	0.002	-.0661604	-.0152374
hdi	6.648027	.6844392	9.71	0.000	5.291206	8.004848
score	.0030106	.0122346	0.25	0.806	-.0212431	.0272643
_cons	.9471343	.6114827	1.55	0.124	-.2650587	2.159327

```
. regress satisfaction ratio unempl hdi
```

Source	SS	df	MS	Number of obs	=	112
				F(3, 108)	=	62.96
Model	128.934841	3	42.9782803	Prob > F	=	0.0000
Residual	73.7250707	108	.682639544	R-squared	=	0.6362
				Adj R-squared	=	0.6261
Total	202.659912	111	1.82576497	Root MSE	=	.82622

satisfaction	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ratio	.0593867	.0150009	3.96	0.000	.0296524	.089121
unempl	-.0411176	.0126752	-3.24	0.002	-.066242	-.0159933
hdi	6.763777	.4950169	13.66	0.000	5.782568	7.744987
_cons	1.059247	.4060661	2.61	0.010	.254353	1.86414

```
. regress satisfaction ratio unempl hdi dev
```

Source	SS	df	MS	Number of obs	=	112
				F(4, 107)	=	47.22
Model	129.372433	4	32.3431082	Prob > F	=	0.0000
Residual	73.2874789	107	.68492971	R-squared	=	0.6384
				Adj R-squared	=	0.6249
Total	202.659912	111	1.82576497	Root MSE	=	.8276

satisfaction	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ratio	.0609163	.0151474	4.02	0.000	.0308884	.0909441
unempl	-.0407739	.0127037	-3.21	0.002	-.0659574	-.0155903
hdi	6.363055	.7051279	9.02	0.000	4.965221	7.760889
dev	.198312	.2481061	0.80	0.426	-.2935294	.6901534
_cons	1.26019	.4781675	2.64	0.010	.312279	2.208102